

Candidate Name \_\_\_\_\_

Centre Number      Candidate  
Number

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**International General Certificate of Secondary Education  
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE**

**MATHEMATICS**

**0580/2, 0581/2**

**PAPER 2**

**MAY/JUNE SESSION 2000**

**1 hour 30 minutes**

Candidates answer on the question paper.

Additional materials:

Electronic calculator

Geometrical instruments

Mathematical tables (optional)

Tracing paper (optional)

**TIME**      1 hour 30 minutes

**INSTRUCTIONS TO CANDIDATES**

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

If working is needed for any question it must be shown below that question.

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets [ ] at the end of each question or part question.

The total of the marks for this paper is 70.

Electronic calculators should be used.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For  $\pi$ , use either your calculator value or 3.142.

**FOR EXAMINER'S USE**

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**This question paper consists of 12 printed pages.**

- 1 The height of Mont Blanc is 4810 m, correct to the nearest 10 m. What is its **least** possible height?

Answer ..... m [1]

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- 2 Find the mean of the **next two** prime numbers after 29.

Answer ..... [1]

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- 3 A television advertisement claims "Because the earth is rotating at over 1000 miles per hour, you will travel over 650 million miles in a lifetime".  
Calculate, to the nearest year, the length of a "lifetime".

Answer ..... years [2]

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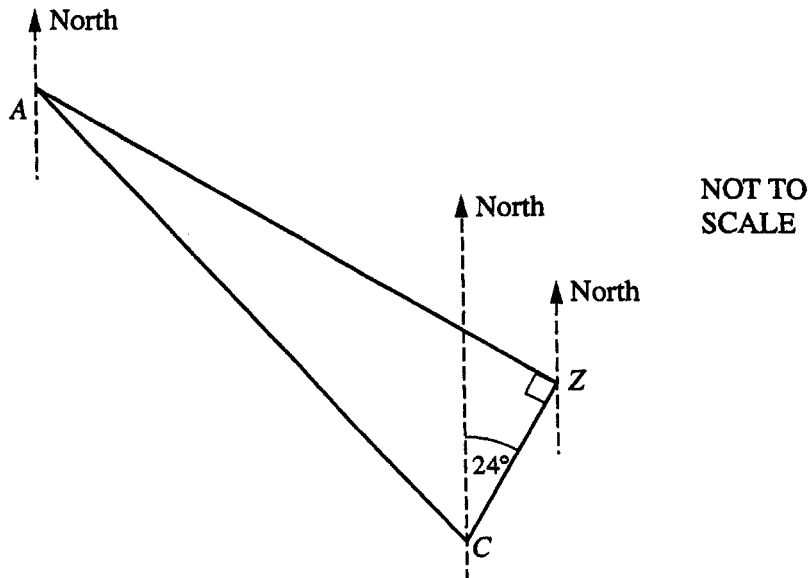
- 4  $x = 3.4 \times 10^{-3}$ ,  $y = 1.2 \times 10^{-1}$  and  $z = 4.6 \times 10^{-4}$ .  
Place one of the symbols  $>$ ,  $=$  or  $<$  in the spaces below to make each statement correct.

(a)  $x$  .....  $y$ , [1]

(b)  $x + y$  .....  $z$ . [1]

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5



The diagram shows the positions of Cairo ( $C$ ), Alexandria ( $A$ ) and Zagazig ( $Z$ ).  
The bearing of  $Z$  from  $C$  is  $024^\circ$  and angle  $AZC$  is  $90^\circ$ .  
Find the bearing of

(a)  $C$  from  $Z$ ,

Answer (a) ..... [1]

(b)  $Z$  from  $A$ .

Answer (b) ..... [1]

- 6 In the 1998 Grand Prix in Australia, Mika Hakkinen completed the fastest lap in a time of 1 minute 31.649 seconds. His average speed was 208.303 kilometres per hour for that lap. Calculate the length of the lap, to the nearest metre.

Answer ..... m [2]

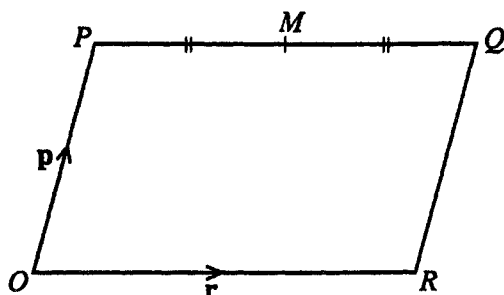
- 7 (a) Write  $(8x^4y)^2$  without brackets.

Answer (a) ..... [1]

- (b) Simplify  $(8x^4y)^2 + x^2y^{-1}$ .

Answer (b) ..... [2]

8



NOT TO  
SCALE

- (a)  $OPQR$  is a parallelogram and  $M$  is the midpoint of  $PQ$ .  
Vector  $\overrightarrow{OP} = \mathbf{p}$  and vector  $\overrightarrow{OR} = \mathbf{r}$ .  
Write in terms of  $\mathbf{p}$  and/or  $\mathbf{r}$

- (i)  $\overrightarrow{QM}$ ,

Answer (a)(i)  $\overrightarrow{QM} = \dots\dots\dots$  [1]

- (ii)  $\overrightarrow{RM}$ .

Answer (a)(ii)  $\overrightarrow{RM} = \dots\dots\dots$  [1]

- (b) The position of  $R$  is 3 units due east of  $O$ , so that the column vector  $\overrightarrow{OR} = \begin{pmatrix} 3 \\ 0 \end{pmatrix}$ .  
The position of  $S$  is 3 units due south of  $O$ .  
Write down the column vector  $\overrightarrow{OS}$ .

Answer (b)  $\overrightarrow{OS} = \begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [1]

- 9 A class has fewer than 30 students.  
Exactly  $\frac{2}{3}$  of the students in the class own a football.  
Exactly  $\frac{7}{8}$  of the students in the class own football boots.

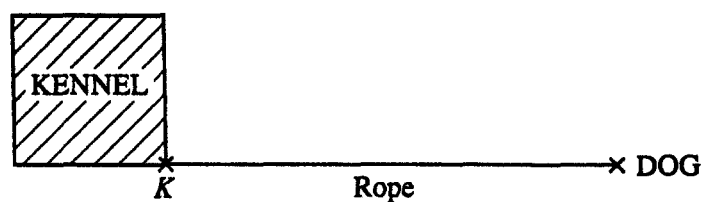
- (a) How many students are in the class?

Answer (a) ..... [1]

- (b) What is the **smallest** number of these students who own **both** a football and football boots?

Answer (b) ..... [2]

10



A dog is tied to one corner ( $K$ ) of a fixed square kennel by a rope. This is shown in the scale diagram above.

Draw accurately on the diagram the path of the dog as it moves **anticlockwise** around the kennel with the rope always tight. [3]

- 11 Claudia records the midday temperature from Monday to Friday. She finds that the mean temperature is  $0^{\circ}\text{C}$ , the mode is  $-2.4^{\circ}\text{C}$  and the median is  $-1.3^{\circ}\text{C}$ . The temperature either stays the same or increases each day and the maximum temperature is  $4.5^{\circ}\text{C}$ . Fill in the temperatures in the table below.

| Day                                | Monday | Tuesday | Wednesday | Thursday | Friday |
|------------------------------------|--------|---------|-----------|----------|--------|
| Temperature ( $^{\circ}\text{C}$ ) |        |         |           |          |        |

[3]

12 Find the value of  $x$ ,  $y$  and  $z$  when

(a)  $3^x = 1$ ,

Answer (a)  $x = \dots\dots\dots$  [1]

(b)  $10^y = 0.01$ ,

Answer (b)  $y = \dots\dots\dots$  [1]

(c)  $16^z = 2$ .

Answer (c)  $z = \dots\dots\dots$  [1]

- 13 (a) Dina bought a car from a salesman for \$8400.  
When Dina sells the car she makes a loss of  $22\frac{1}{2}\%$ .  
For how much did she sell the car?

Answer (a) \$  $\dots\dots\dots$  [1]

- (b) The salesman made a profit of 40% when he sold the car for \$8400.  
How much did he pay for the car?

Answer (b) \$  $\dots\dots\dots$  [2]

- 14 Find  $f^{-1}(x)$ .

$$f(x) = 3 + \sqrt{2x}, \text{ for } x > 0.$$

Answer  $f^{-1}(x) = \dots\dots\dots$  [3]

- 15 The brightness ( $B$ ) of an object varies inversely as the square of the distance ( $d$ ) of the object from a light.  
When  $d = 12$ ,  $B = 2$ .

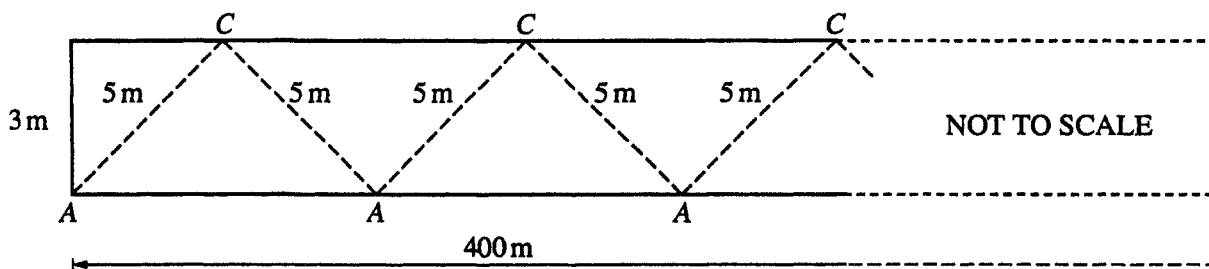
(a) Find an equation connecting  $B$  and  $d$ .

Answer (a) ..... [2]

(b) Find the value of  $B$  when  $d = 3$ .

Answer (b) ..... [1]

- 16 To celebrate the year 2000, a city planted apple trees (A) and cherry trees (C) on a rectangular strip of land 3 metres wide and 400 metres long. The trees were planted as shown in the diagram.



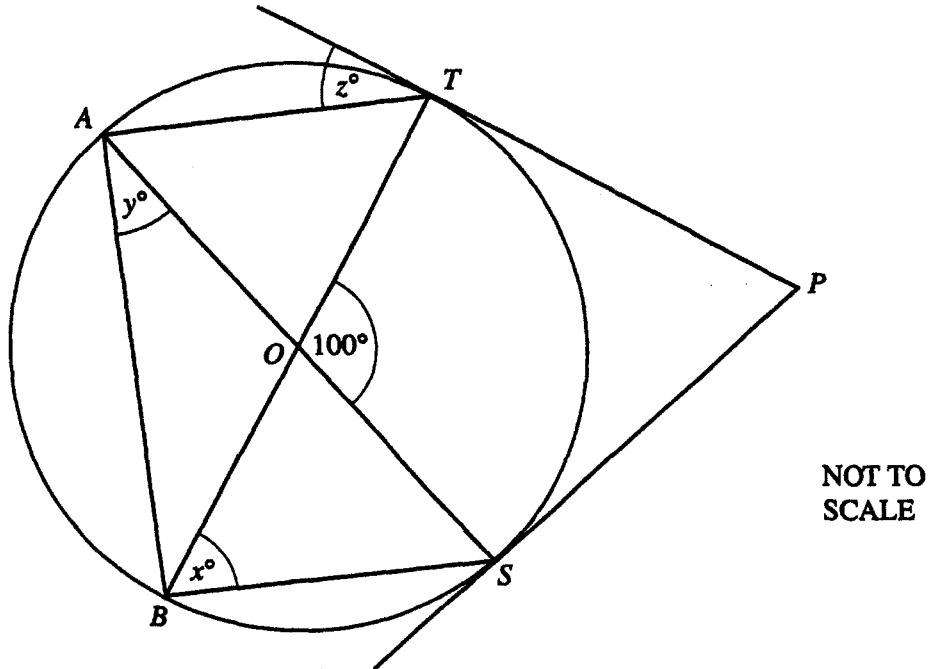
Calculate the number of

(a) apple trees,

Answer (a) ..... [3]

(b) cherry trees.

Answer (b) ..... [1]



$PT$  and  $PS$  are tangents to a circle centre  $O$ .  $TOB$  and  $AOS$  are diameters and angle  $TOS = 100^\circ$ .

(a) Find the values of  $x$ ,  $y$  and  $z$ .

Answer (a)  $x = \dots\dots\dots$  [1]

$y = \dots\dots\dots$  [1]

$z = \dots\dots\dots$  [1]

(b) Is  $AS$  parallel to  $TP$ ? Give a reason for your answer.

Answer (b)  $\dots\dots\dots$  [1]

18 Omar buys one present each for Alex, Bukki and Chris. The present for Alex costs twice as much as the present for Chris, but only costs three quarters as much as the present for Bukki.

(a) Write, in its simplest form, the ratio of the costs of the presents for Alex : Bukki : Chris.

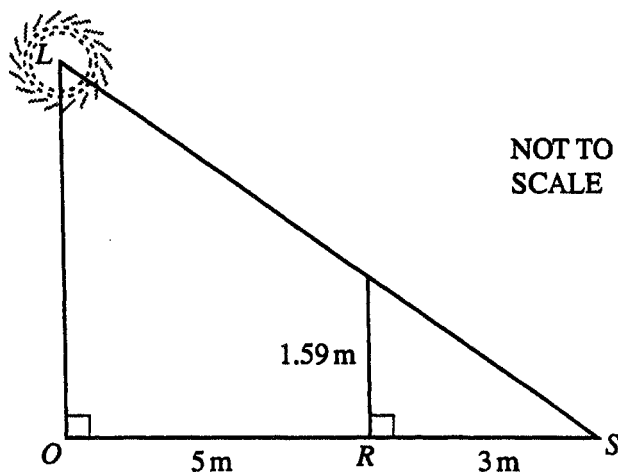
Answer (a)  $\dots\dots\dots : \dots\dots\dots : \dots\dots\dots$  [2]

(b) Omar spent \$21.25 altogether for the three presents. What was the cost of the present for Bukki?

Answer (b) \$  $\dots\dots\dots$  [2]



19 (a)



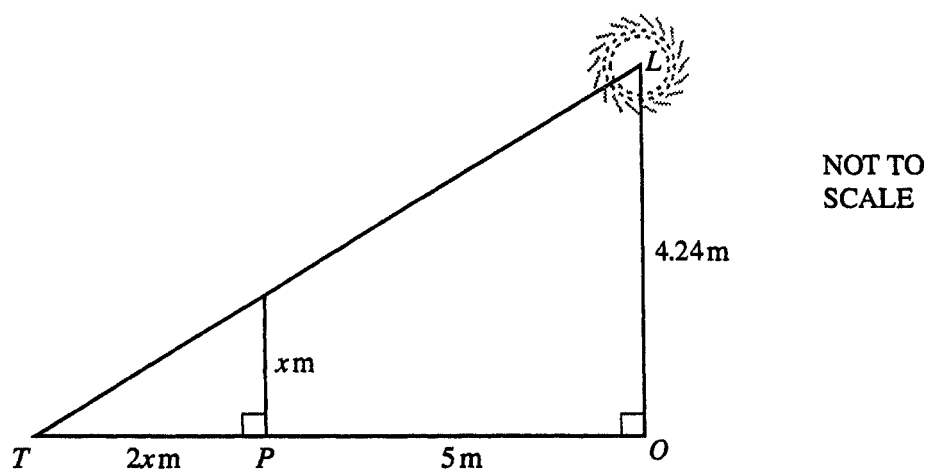
Robert stands at the point  $R$  on level ground, 5 metres from the base of a lamppost  $OL$ . Robert is 1.59 m tall and his shadow  $RS$  is 3 m long.

Show by calculation that the height of the lamppost  $OL$  is 4.24 m.

Answer (a)

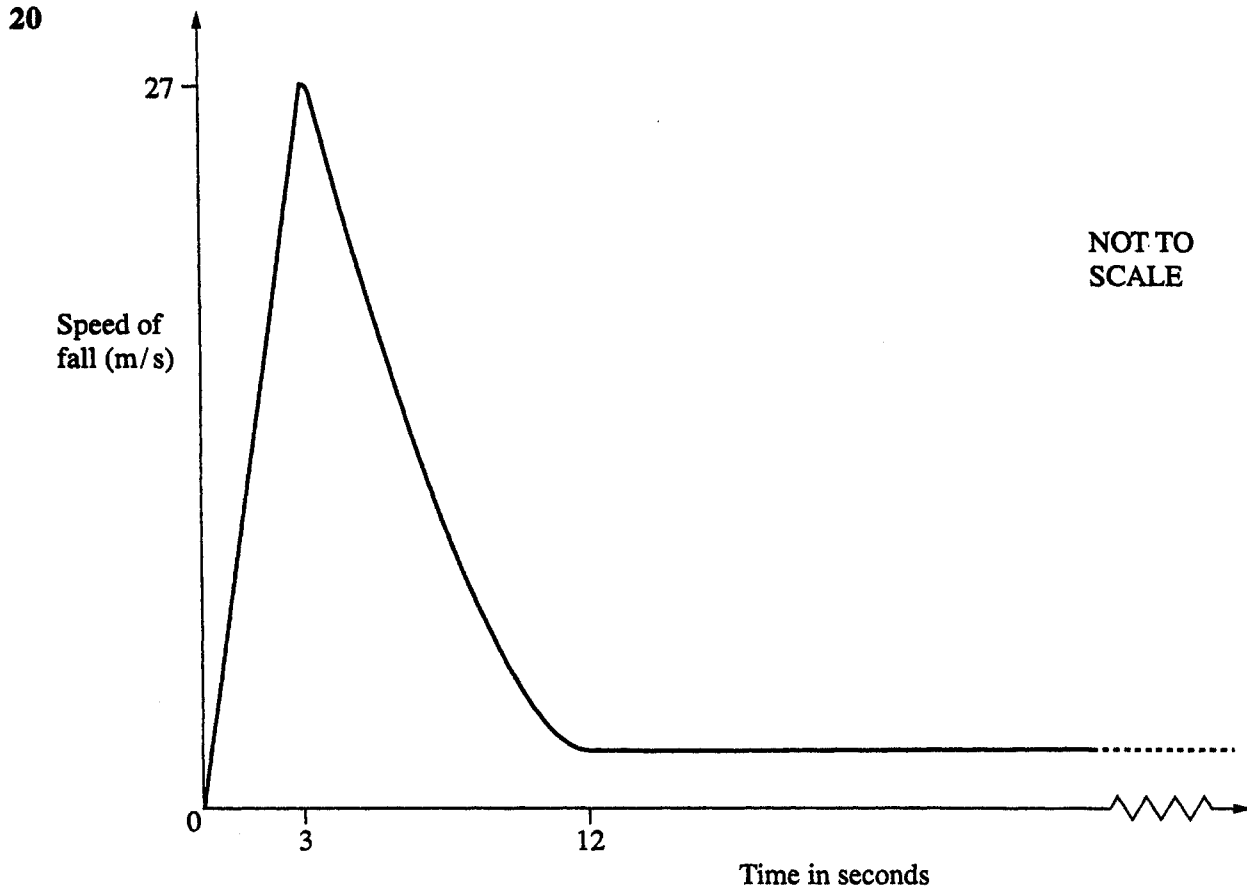
[2]

(b)



Pierre stands on level ground at the point  $P$ , 5 metres from  $O$ . Pierre is  $x$  metres tall and his shadow  $PT$  is  $2x$  metres long. Find the value of  $x$ .

Answer (b)  $x = \dots\dots\dots$  [2]



Simon jumps from a balloon. He falls faster and faster with constant acceleration until after 3 seconds he opens his parachute. His speed decreases for the next 9 seconds and then remains constant until he lands on the ground. The speed - time diagram above shows this.

(a) For the first 3 seconds, calculate

(i) his acceleration,

Answer (a)(i) .....m/s<sup>2</sup> [1]

(ii) the distance he falls.

Answer(a)(ii) .....m [1]

(b) The total distance Simon falls in the first 12 seconds is 112 m. His constant speed after that is 2 m/s. Calculate in minutes and seconds the **total** time for his jump if the balloon was 1000 metres above the ground.

Answer (b) ..... min..... s [2]

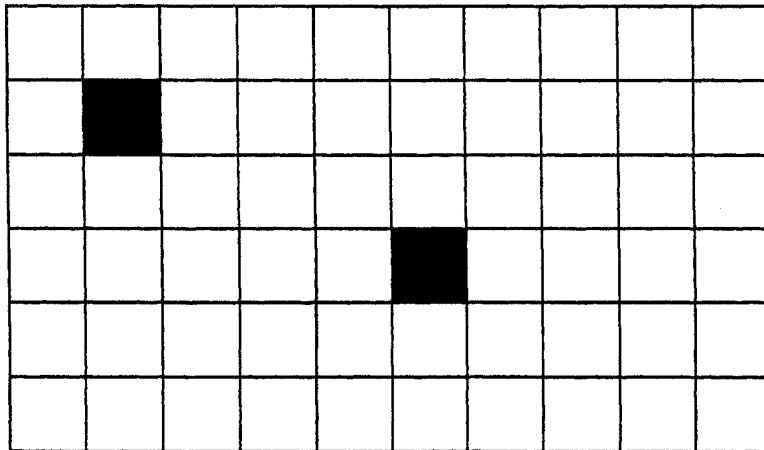
- 21 (a) Write  $\frac{1}{x-3} - \frac{1}{x}$  as a single fraction in its simplest form.

Answer (a) ..... [2]

- (b) Use your answer to **part (a)** to make  $y$  the subject of the formula  $\frac{1}{y} = \frac{1}{x-3} - \frac{1}{x}$ .

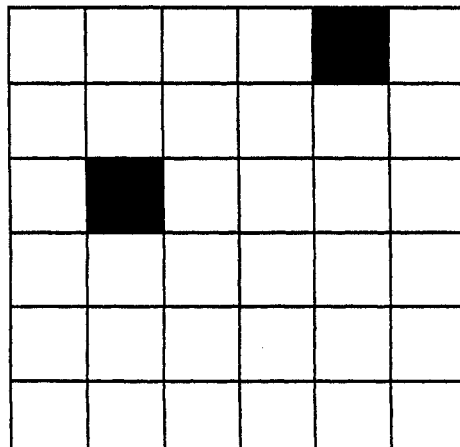
Answer (b) ..... [2]

- 22 (a) Shade in the **minimum** number of squares so that this rectangular grid has 2 lines of symmetry.



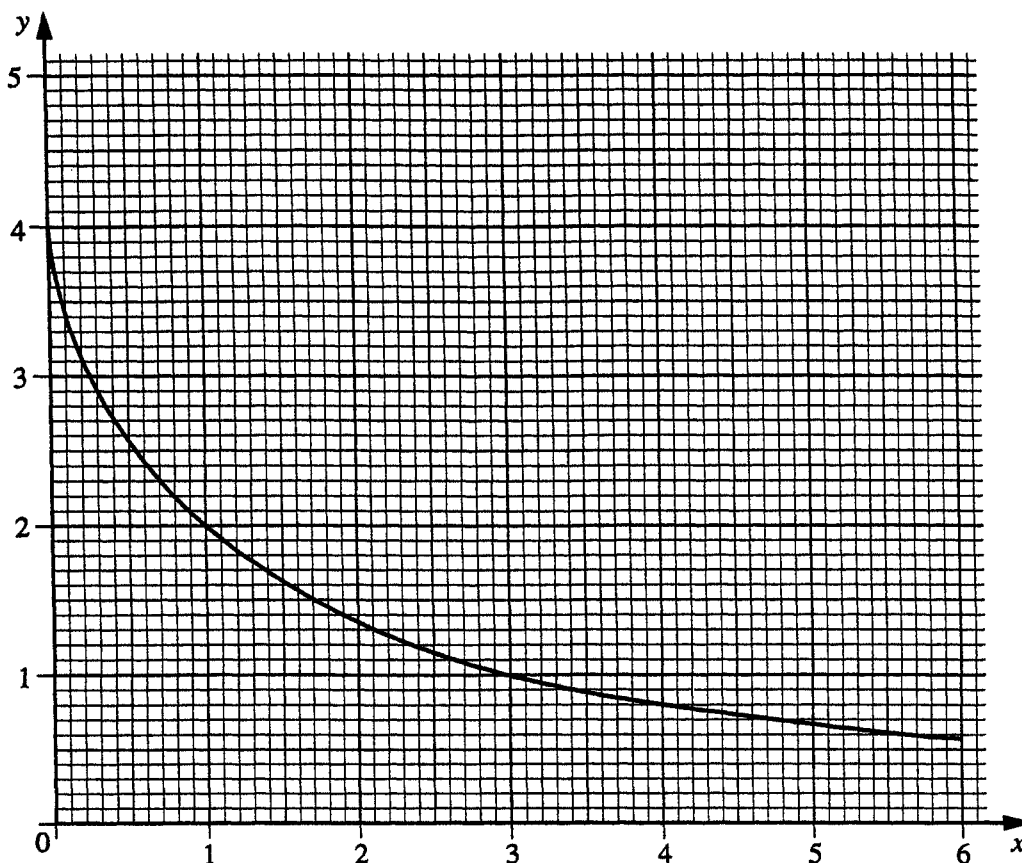
[2]

- (b) Shade in the **minimum** number of squares so that this square grid has rotational symmetry of order 4.



[2]

23



The graph of  $y = f(x)$  is shown above.

(a) Use the graph to find (i)  $f(2)$ ,

Answer (a)(i)  $f(2) = \dots\dots\dots$  [1]

(ii)  $f^{-1}(2)$ .

Answer (a)(ii)  $f^{-1}(2) = \dots\dots\dots$  [1]

(b) Draw the tangent to the graph at  $x = 1$ . Use it to calculate an estimate of the gradient (slope) of the graph at this point.

Answer (b) gradient =  $\dots\dots\dots$  [3]